

Lectures and Essays by the late William Kingdon Clifford, F.R.S. Edited by Leslie Stephen and Sir Frederick Pollock. 2 vols. Pp. 410, 342. (London: Macmillan and Co., Ltd., 1901.) Price 10s.

IT is neither upon his popular lectures nor upon his crude essays in metaphysics that Clifford's permanent reputation is based. But it is not surprising that they still find numerous readers; they are so free from pedantry, so engagingly frank, so evidently the work of a man who sought truth with a really passionate desire. We may smile at Clifford's theory of "brain-stuff," which is easily demolished by the very same kind of criticism which he himself applied to "The Unseen Universe"; we may feel justly astonished that a mind so penetrating in many ways should believe that consciousness is a complex of elementary feelings, which can separately exist as things in themselves; we may regret the occasional bitterness of his invectives, even while we remember that they were inspired by a hatred of priestcraft and superstition. But with all this, when we turn again to these fresh and stimulating pages, and when we read once more Sir Frederick Pollock's graceful and generous introduction, we can understand how Clifford charmed and impressed his contemporaries, and how keen was their sorrow at his premature death. It is, perhaps, not altogether fanciful to compare Clifford's fate with that of Robert Louis Stevenson; in each case a reaction has followed the too partial praise of admiring friends, and this disparagement is again being corrected by a more dispassionate criticism.

Teoria delle Funzioni Analitiche. By Giulio Vivanti. Pp. 432. (Milan: Ulrico Hoepli, 1901.) Price 3 lire.

"A POCKET guide to the Theory of Functions," may strike many pure mathematicians as being a rather startling innovation. But the rate at which mathematical knowledge is added to every year makes it increasingly difficult for a mathematician to acquire a thorough acquaintance of more than a very limited range of study, and if the physicist, for example, has to derive his information on the theory of functions from large treatises and scattered literature, "life is too short" and the work is crowded out by other matters.

The book is divided into three parts, the first containing the elements of the theory of groups, the second the general theory of analytical functions, while the third contains a sketch of certain recent developments of the theory of functions. Prof. Vivanti bases his treatment on Weierstrass's methods. At the end is a list of 218 books and papers dealing with the subject, all for the very small price of half-a-crown.

It is much to be wished that a reaction may be set on foot in this country against the over-elaboration and specialisation of mathematical text-books by the publication of a series of small handbooks similar to this little Italian treatise. The need for a change of this kind is well illustrated by a copy of the 1860 edition of Routh's "Rigid Dynamics," which the present writer has just acquired. It bids fair to be much more useful in teaching a certain class of student than the modern large two-volume editions.

Graduated Exercises in Elementary Practical Physics. By C. J. Leaper. Pp. iii + 264. (London: Biggs and Co., 1901.) Price 2s. 6d.

THIS contains the usual elementary exercises in physics, and it is not obvious what special advantages it offers. Many of the diagrams are very bad, and the printing is poor. Examples are given for the students to follow; thus we find the product in Boyle's law carried to six significant figures, and the latent heat of fusion of ice to five figures. How often are we to cry out against this?

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LETTERS TO THE EDITOR.

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The Education Bill.

THE suggestion in your editorial memorandum last week on this subject is one for which there is a remarkable precedent in the history of educational controversy. That suggestion is to the effect that, having regard to the complexity of the subject, to the fact that the urgent need of our time is the organisation of secondary and higher instruction, while the condition of our primary instruction is, on the whole, satisfactory and but for the demands of the voluntary schools would not require any material change at all, it would be well to divide the Bill into two parts and to press forward during the present session the enactment, with due modifications, of that part which affects intermediate and scientific education, and so to leave the part relating to elementary education for fuller consideration another year.

This course would be precisely similar to that adopted by Mr. W. E. Forster in 1869, the year before the Elementary Education Act. He had been a member of the Schools Inquiry Commission, which had recently issued a memorable and most comprehensive report, the work largely of the late Lord Lyttelton and the present Archbishop of Canterbury. As Vice-president of the Council, he introduced the Endowed Schools Bill, which was designed to deal with the whole problem of secondary as distinguished from elementary instruction. The Bill was divided into two parts, the former providing for the urgent need of the moment, the reform of the ancient and often obsolete and useless endowed foundations, and the latter constituting central and local authorities for the coordination and improvement of all classes of secondary schools—private, proprietary and municipal—for the registration of teachers, for the provision of needful schools, and for the construction of a coherent system of secondary education for the whole country. But it happened then, as it is happening now, that such a large and far-reaching proposal touched many interests and involved many difficulties, and that it proved impossible to pass the whole Bill in one session. So Mr. Forster wisely abandoned the second part of the Bill, and resolutely secured the passing of the first. The Endowed Schools Act thus simplified and placed on the statute book is still in force, and has proved to be one of the most beneficent of modern Acts of Parliament. It created a special Commission, with power to inquire into the history and resources of educational foundations, to revise and modernise their statutes and deeds of gift, to reform the governing bodies, and to secure the permanence and increased public usefulness of educational endowments generally. Other attempts have been made in subsequent years to deal piecemeal with the larger projects of educational reform contemplated by the Government of 1869; but it remains on record that if an attempt had been made to enforce the enactment of the whole measure, the Endowed Schools Act, which has proved of such signal public service, would never have been passed.

Without renewing any discussion as to the merits or demerits of the new Bill, it may interest your readers to be reminded of the precedent thus set more than thirty years ago. If that precedent were followed in the present case, it would at least give an opportunity to the newly constituted local authorities to deal at once with technical and secondary education, and thus to gain a new title to public confidence. The public would then be enabled to judge, after one or two years' experience, of the expediency of entrusting to these bodies the larger and more difficult task which the present Bill proposes to hand over to them—the virtual reconstruction of the whole existing system of elementary education.

J. G. FITCH.

Athenæum Club, April 22.

I FIND myself in entire agreement with the views expressed by Principal Lodge in the last number of NATURE. And if any practical illustration were needed to support them, I think it is afforded by the invaluable work which has been done for secondary education in the county of Surrey.

Until the County Council took the matter up, the educational destitution of western Surrey as regards secondary schools was

deplorable. There was no provision for either carrying on the education of the best boys at the primary schools, or for educating the large class of sons of artisans and others for whom the primary schools were insufficient and such private-adventure schools as existed altogether inadequate. As a governor of the Richmond School I am able to speak with confidence of the remarkable success which has attended its establishment.

As regards Surrey I do not see, therefore, that the Bill will put us in a much better position than we are at present. But the present crying need is that primary education should be dealt with on the same lines. It would, in my opinion, be a real disaster if the part of the Bill relating to it were to be dropped, as has been proposed in these pages.

In the Borough of Richmond the arrangements for primary education can hardly be described as other than chaotic. I am by no means persuaded that the establishment of a School Board would make matters much better. We might gain something in one direction at the cost of losing all chance of coordinating our arrangements for primary with those for secondary instruction. The one should dovetail into the other, which it is little likely to do if they are in different hands. I am wholly at a loss to see why an organisation which has solved one problem should not be able to solve both.

Kew, April 21.

W. T. THISELTON-DYER.

The Dangers of Coral Reefs to Navigation.

IN consequence of a paper which I recently read before the Royal Geographical Society on "The Formation of the Maldives," I have received several letters from officers of the mercantile marine. These lead me to believe that the danger incurred by too closely approaching coral reefs and islands is not generally perceived. Further, I have myself seen large passenger steamers coasting round the south of Minikoi Atoll within 300 yards of its encircling reef. Indeed, one large liner was so close in that the look-out man at the mast head could not have failed to see the bottom. The practice of approaching so near *where unnecessary*—to enable passengers to get a good view of the land and reef—is one attended with considerable danger and greatly to be deplored.

It is generally known that most reefs on their seaward faces slope gradually from their edges to 25-50 fathoms, and then more steeply to 100-200 fathoms. The breadth of this inner slope or reef-platform varies in the Maldives and Laccadives from half-a-cable to half-a-mile. Its surface, especially down to 20 fathoms, is extremely uneven, great buttresses and masses of rock arising to within a few fathoms of the surface. Such rocks are very generally covered with green corals or dark-coloured, calcareous algae, so that except in absolutely calm weather they may not readily be perceived. Further, isolated coral heads—separate coral colonies—may grow up on any rocks within about 20 fathoms of depth almost to the surface. I have in Maldivian lagoons been twice stranded on such heads, arising respectively from 8 and 14 fathoms. At the seaward ends of passages into atolls of the same group, where the conditions are not very dissimilar to those outside atolls, similar heads not infrequently grow from 15 fathoms or even deeper to within 2 or 3 fathoms of the surface. The tops of these are often only a few yards across, so small indeed that they may be easily missed in any survey, however careful.

It is apparent then that dangerous rocks may arise on any part of the reef-platform. The outer steep slope is often so precipitous that the edge of this platform is only separated by a few yards from the 100-fathom line. The latter is usually very carefully charted, but for safety liners and deep-draught steamers should pass well to seaward of it. J. STANLEY GARDINER.

Gonville and Caius College, Cambridge, April 20.

Rearrangement of Euclid Book I.

I HAVE always taken it for granted that the *chief*, if not the *only*, objection to Euclid's Elements as forming an introductory course in geometry is that a very large proportion of beginners are unable to work riders for themselves, and consequently they are reduced to the necessity of merely reading up the propositions in such a way as to be able to reproduce them more or less mechanically in the examination room.

This difficulty does not exist in algebra because, taking simple

equations as an instance, it is easy by varying the numerical coefficients to furnish the beginner with an unlimited variety of *numerical examples* which, being all solved by the *same* method, do not present such difficulties as Euclid "riders," each of which is practically a separate problem or theorem requiring a *different* method of solution.

The wide gap between the reproduction of bookwork and the devising of methods of solving riders presents a serious obstacle to the progress of beginners. What I at present fail to see is how the gap would be bridged over either by a rearrangement of the propositions in Book I. or by any of the substitutes for Euclid which have been suggested of recent years, and I much hope that this letter may be the means of eliciting fuller information on the direct connection between the present unsatisfactory state of affairs and the proposed remedies. G. H. BRYAN.

Bangor.

The Morphology of the Pleuronectidæ.

ABSENCE from Liverpool has prevented me replying to Mr. J. T. Cunningham's criticisms of the work on the anatomy of the Plaice recently published by Mr. Johnstone and myself. The passage which Mr. Cunningham chiefly objects to is as follows:—"If [the dorsal fin] occupies the mid-dorsal line of the head, then it is obvious that the left eye must have actually passed through the substance of the head to reach the ocular side. This supposition, absurd as it may seem to us now, was in fact believed by such an observer as Steenstrup." In "correcting" this passage Mr. Cunningham says:—"The truth of the matter is that Steenstrup did not believe any supposition, absurd or otherwise, on the subject, but stated from actual observation that in certain larval Pleuronectidæ the eye of one side passed through the tissues of the head and emerged on the other side. The form in question was long known as *Plagusia*, and is now known to be the larva of *Rhomboidichthys*. The truth of Steenstrup's observations was fully confirmed by Alexander Agassiz at Newport, R.I."

Now on referring to Steenstrup's memoir again I find that it is Mr. Cunningham himself who has misunderstood that author. For whilst Steenstrup certainly observed an *apparent* passage of the eye through the head, he also *supposed* that the eye passed actually through the tissues of the head itself, as apart from those of the dorsal fin, which cannot, of course, be considered a part of the head. This is the theoretical deduction that I characterised as absurd, since it is needless to say that neither Steenstrup nor Agassiz ever witnessed so impossible a phenomenon. Indeed, both Agassiz and Ehrenbaum state, quite correctly, that the migrating eye lies between the base of the dorsal fin and the roof of the head, and therefore only "apparently passes through the head" (Agassiz).

The significance of the asymmetry of "*Plagusia*" has been made quite clear by the short but important paper recently published by Nishikawa. This paper renders almost certain the deduction which I think most morphologists would have drawn from Agassiz's work, viz., that the metamorphosis of *Plagusia* is in all essential respects similar to that of the Plaice. The fact that here the dorsal fin grows forwards *before* metamorphosis sets in has not affected the fundamental character of the torsion, for the migratory eye is, of course, *morphologically outside the head during the whole of its transit*. Nishikawa says, and very truly:—"In every case, the passage of the eye from one side to the other in flat fishes is morphologically along the dorsal surface of the head." The statement, therefore, to which Mr. Cunningham takes exception is absolutely correct, and it seems that, living remote from scientific libraries and doubtless unable to consult the original, Mr. Cunningham's memory has led him astray.

Mr. Cunningham's second point involves an academic issue that I must leave others to discuss. Prof. Mitsukuri once remarked to me, in connection with his having undertaken some systematic work, that he had temporarily abandoned the morphological pursuit of similarities, in favour of the systematic search for differences. Thus, whilst many systematists, with their taxonomic details, would widely separate the Pleuronectidæ from the Gadidæ (although Jordan and Evermann, whom we followed, do not), most morphologists, taking a much broader if less precise view of the question, would say that a Plaice was simply an asymmetrical cod-fish. And both may be right judged by their own standards. F. J. COLE.

University College, Liverpool, April 14.